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Tablet-based cross-curricular maths vs. traditional maths classroom practice for higher-order learning outcomes

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ABSTRACT

This study examined the impact of tablet-based cross-curricular maths activities on the acquisition of higher-order learning outcomes over seven months in twelve third grade classrooms in Slovenia. In the experimental group (N = 124), classroom practice included tablet-based cross-curricular maths activities with post-participation testing to identify the effect on learning outcomes, and observations were conducted to identify the affordance and ergonomic characteristics of tablets for student learning. In the control group (N = 135) maths was taught as a discrete subject with traditional paper and pencil technology using manipulation of concrete objects. Groups were matched with respect to gender, ownership of a tablet computer and previous knowledge and understanding of maths. The instructional design of process-outcome strategies incorporated Bruner's (1966) three stage process with learning outcomes in the cognitive, affective-social and psychomotor domains. The affordance of tablet-based cross-curricular apps was examined with respect to domains of learning and ergonomics. The findings indicate that the tablet supported group had better outcomes, with a small effect size for conceptual knowledge (r = 0.10) and medium effect size for procedural knowledge (r = 0.33) and problem-solving abilities (r = 0.30). The authors therefore argue for the introduction of tablets in schools because their multi-sensory human-computer touch interaction provides interactive manipulatives supporting transition between representations on the concrete, visual and abstract level. The authors concluded that in cross-curricular maths teaching, tablets offers efficient use of resources from different subjects and multiple representations which facilitate learning outcomes in the cognitive, affective-social and psychomotor learning domains.

1. Introduction

Mathematical competences and skills are basic life competences and are crucial for active engagement in all aspects of life. Dynamic and interdisciplinary knowledge and abilities are needed to help people to face unforeseeable problems in real life

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